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Editorial

The impact of COVID-19 on population oral health

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Over the last year, coronavirus disease 2019 (COVID-19) has accumulated over 37 million cases and over one million deaths worldwide (WHO, 2020). With no population immunity or vaccine at hand, all but fifteen countries issued 'stay at home' orders in a bid to contain the spread of the virus and limit the healthcare burden. 'Lockdown' included closure of dental practices. Both the virus itself and the various Government responses have had a profound impact on the work, home and social lives of the entire population and are likely to impact the oral health of many people. These oral health effects can be attributed to those caused directly by the virus and those caused indirectly through the subsequent societal response.

Direct effects of COVID-19 on oral health include ageusia (an official symptom of COVID-19) and case reports of vesiculobullous lesions and necrotising periodontal disease (Patel and Woolley 2020). The ageusia associated with COVID-19 is transient and reports of other oral manifestations are based on low-grade and disputed evidence. The direct effects of COVID-19 are likely to be of modest consequence for population oral health.

A conceptual framework

The indirect effects are more complex and extensive. They arise from restricted access to oral healthcare and can therefore be understood using Andersen's (2014) model of health service use. This comprehensive framework facilitates understanding of the interactions between people, healthcare systems and the external environment. People's access to healthcare can be predisposed by social, cultural, individual and economic factors. Enabling factors (such as the way health services are organised, financed and governed) increase or decrease access. Access is further influenced by need, whether perceived or normatively determined. Behavioural factors (including personal health-related and directed behaviours and professional processes of care) also affect access. Later versions of the model incorporate outcomes of care, specifically linking health and patient satisfaction as intended outcomes of service use. The model has proved to be a useful way to study access to oral healthcare (Baker, 2009; Marshman *et al*., 2012).

Predisposing factors

Individuals are well-aware of the burden of COVID-19 on healthcare services and some are hesitant to add to this by using them. Four in ten people were too concerned about burdening the National Health Service (NHS) to seek help from their general practitioner (GP) (NHS, 2020). Despite small increases in GP referrals to hospitals since April, the number remains at half of its value from 2019 (British Medical Association, 2020). This reduced demand may translate to dental service use, where it is known that dentists can see fewer patients.

Access may also be impaired by anxieties associated with concerns about contracting the virus or even re-engaging with society, following social isolation (Torales *et al*. 2020). One survey found that twice as many patients wanted to delay their routine dental appointments due to concerns of COVID-19 infection (Heffernan, 2020). This effect may be exacerbated if non-attendance reinforces dental fear and phobia.

The material effects of long-lasting reduced income may have negative effects on population oral health. Lower purchasing power might affect diet and oral hygiene as well as other behavioural and cultural predispositions, including health-damaging behaviours such as smoking and reduced dental attendance. If the pandemic and its consequences disproportionately affect lower socio-economic groups, one effect may be to widen socioeconomic inequality. This could amplify existing oral health inequalities. Workforce modernisation and forced business evolution may further exacerbate demographic polarisation.

Enabling factors

Economic decline may also reduce the healthcare system's ability to provide care as an enabling factor. In some countries, prolonged economic recession with greater national debt and reduced taxable income will threaten government funding on health, which could compromise service availability and increase patient costs. Furthermore, the pressures of elevated equipment costs and reduced footfall will compromise revenue from patients. Dentists are already passing on this additional expense to patients, further reducing the affordability of care.

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COVID-19 forced healthcare policymakers to end all routine and most urgent dental care. In most cases, following triage and assessment, clinicians offered self-care advice, or prescribed analgesia or antibiotics. Only people with the most severe acute dental problems were offered urgent dental care (UDC). Theoretically at least, this period of elevated antibiotic prescription may promote antimicrobial resistance, especially when considering antibiotics are rarely indicated for the management of acute dental infections.

In England, COVID-19 has cast light on potential inefficiencies and inequity in the UDC system. Despite being triaged, patients could not be referred directly to UDC centres, but instead had to contact dental practices. Individuals reported being unable to contact the practices and some practices could not accommodate unregistered patients, even though such patients are likely to have the greatest dental need. Referral to UDC often meant longer travel times for patients, further impairing access. This was exacerbated by restricted public transport. Reduced service availability has had dramatic effects on patient behaviour, with individuals resorting to 'Do-It-Yourself Dentistry' during lockdown (Lowbridge, 2020). There is also the risk that the detection of cases of oral cancer has been delayed.

As the incidence of COVID-19 infection fell, there was a phased re-opening of dental practices, with considerable variation in the guidance given for safe reopening. The backlog of deferred dental work may pose a threat to the oral health of affected patients and is likely to impact on future service availability. Upon re-opening, two-thirds of UK practices are running at less than a quarter of pre-pandemic capacity, with 78% citing the post-treatment procedure for the clearance of infectious aerosols after aerosol-generating procedures as the greatest obstacle towards increasing activity (British Dental Association, 2020).

However, the pandemic may also serve as a useful enabler. The dental profession has re-organised service provision during lockdown. 'Teledentistry' has been widely used to assess and triage patients for urgent dental care, provide advice and monitor patients remotely. Fear of infection and limited appointment availability have promoted this technology to clinicians and patients, moving it a step closer to fulfilling its potential to improve the early detection of oral lesions, reduce costs, the need for specialist referral, waiting times and improve access for those with geographic, economic or cultural barriers to care (Ghai, 2020). The ability to triage patient symptoms may also help to limit the provision of unnecessary care.

The pandemic also offers an opportunity to revolutionise dental care by breaking the 'restorative cycle' of restoration and repair and shifting public investment towards personalised disease prevention. The discouragement of AGPs will limit invasive restorative intervention. Instead, clinicians have been encouraged to make greater use of non-invasive prevention and micro-invasive techniques. This could also be cemented into future generations, as dental students now experience restricted access to AGPs. This change in approach is one example of how the disruption to dental services has created the chance for dentistry to re-orientate services away from low-value care. Instead of funding non-evidence-based procedures (such as routine scaling and polishing), investment could be directed internationally towards interventions such as risk factor modification which yield better population health outcomes at lower costs (Sorenson *et al.*, 2020; Watt, 2020).

The emphasis on urgent dental care during 2020 may present models to improve access to emergency dental care, with the lessons learned informing new evidence-based patient triage systems, including accepting referrals from other health care professionals and using centralised booking systems. Such systems should provide data on both the availability of care and population need, orchestrating the chance to combat inequalities in access. Commissioning of dental services could be remodelled to facilitate these changes. All these changes would help cement urgent care and pain relief as the foundation of public health investment within dentistry (Steele, 2009). Furthermore, the introduction of video consultation could mitigate against the over-prescription of antibiotics and assist referral for suspected oral cancer.

Need

As we have seen, reduced availability and lower affordability have increased need for some people.

Health behaviours

Changes in health behaviours in response to COVID-19 are well-documented, with reported increases in snacking, alcohol consumption and less physical activity (Arora and Grey 2020). These behaviours directly threaten oral health. Moreover, negative health-related behaviours cluster together. These behaviours are also correlated with poor mental health and sleep. Infection fears, frustration, inadequate information and supplies, and financial loss have been identified to increase stress. Poor mental health itself is associated with poor oral health. Adverse dietary habits are likely to be encouraged by boredom, stress and increased screen-time exposure, alongside increased stockpiling of food. Such health behaviours are disproportionately distributed amongst lower socioeconomic groups, the elderly, and minority ethnic groups. As such, COVID-19 threatens to polarise existing oral health inequalities through health-related behaviour.

By contrast, whilst some of the population have adopted adverse health behaviours, concurrent increases in other positive behaviours have been reported, with the time liberated by lockdown used to prepare more home-cooked meals (Arora and Grey, 2020). There may have been greater uptake of other oral health-promoting behaviours such as reduced snacking and improved oral hygiene habits. Reduced dental service provision may also promote these behaviours, where some individuals may feel the need to take more responsibility for their own oral care.

COVID-19 is likely to impact human factors in the dental care process. Clinician behaviour may be influenced by fatigue and stress, arising from longer working hours, heightened infection risk or adaptation to new work or home routines. Furthermore, excessive stress is associated with withdrawn, indecisive, inflexible and irritable behaviour. Such behaviours can impact on clinical decision-making and disrupt harmony in the professional team, impairing other clinicians' abilities to raise patient safety concerns.

Outcomes

Reduced service availability may negatively impact on both the acceptability of the service (patients waiting with pain and infection) and long-term oral health of affected patients (the inability to provide continuous care). Greater polarisation of behaviours and the lower accessibility and affordability of care pose the risk of greater oral health inequalities. It will be interesting to see if there are any effects of reduced access to care on population-level health outcomes. In this respect, the COVID-19 pandemic might act as an illuminating natural experiment of the role of dentistry as a determinant of oral health.

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